

(D8) 0099911119

RZ 5799

(19)



JAPANESE PATENT OFFICE

PATENT ABSTRACTS OF JAPAN

(11) Publication number: 09229196 A

(43) Date of publication of application: 02.09.97

(51) Int. Cl

F16J 15/08  
F02F 11/00

(21) Application number: 08056661

(22) Date of filing: 19.02.96

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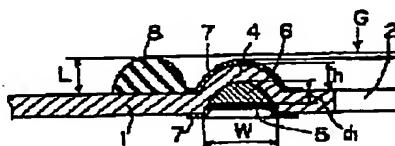
(54) METAL GASKET

(57) Abstract:

PROBLEM TO BE SOLVED: To enhance the sealing performance around a combustion chamber hole by sufficiently compensating the gap between joining surfaces of a cylinder head and block, generated around the combustion chamber when a metal gasket is fastened upon being pinched by the joining surfaces, even in parts apart from a bolt hole.

SOLUTION: The void in beads surrounding a combustion chamber hole 2 in a gasket is filled with a hard synthetic resin layer 6 so that a stopper is formed, and outside the beads an aux. seal ring 8 is furnished which is formed from a resilient material such as rubber and is taller than the beads. The filling height of the resin layer 6 does not exceed the height of the void 5 and is arranged as higher in parts apart from a bolt hole and lower in the part close to the bolt hole.

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## CLAIMS

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[Claim(s)]

[Claim 1] In the metallic gasket equipped with the protruding line bead which consists of a metal plate which has elasticity, has at least one combustion chamber hole and two or more boltholes, and surrounds this combustion chamber hole in the periphery section While filling up internal sky Mabe of the above-mentioned protruding line bead with a hard synthetic-resin layer and forming the stopper section Become the outside of the above-mentioned protruding line bead from a rubber-like elasticity object, and an auxiliary seal ring with height higher than this protruding line bead is prepared. The metallic gasket which the restoration height of the above-mentioned hard synthetic-resin layer does not exceed above-mentioned internal sky Mabe's height, but makes restoration height low in the part which moreover approaches a bolthole, and is characterized by making restoration height high in the part isolated from a bolthole.

[Claim 2] The metallic gasket according to claim 1 whose above-mentioned hard synthetic-resin layer is an epoxy resin layer.

[Claim 3] The metallic gasket according to claim 1 with which the auxiliary seal rings of the combustion chamber hole which extends and adjoins between the combustion chamber holes where the above-mentioned auxiliary seal ring adjoins are mutually formed successively in the both-sides section between holes, and are formed in a single string.

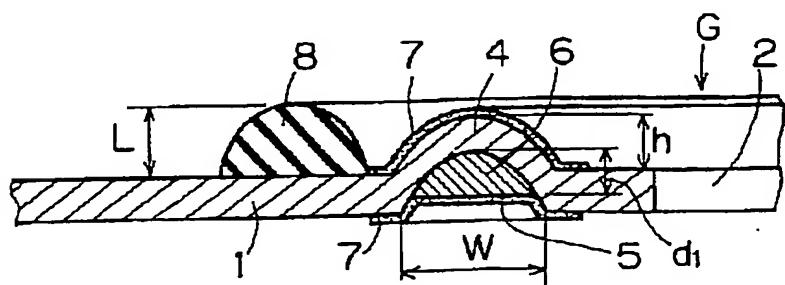
[Claim 4] The height of an auxiliary seal ring is 0.05 thru/or the metallic gasket according to claim 1 or 3 currently formed highly 0.1mm from the height of a protruding line bead.

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[Translation done.]

Drawing selection | Representative drawing

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## DETAILED DESCRIPTION

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### [Detailed Description of the Invention]

#### [0001]

[Field of the Invention] This invention relates to the metallic gasket used as cylinder head gaskets, such as an engine of an automobile.

#### [0002]

[Description of the Prior Art] the cylinder head equipped with the bead which surrounds and carries out the seal of the combustion chamber hole in the periphery section -- public funds -- in a group gasket, it is well-known to carry out to fix a ring-like SIMM plate etc. and to form the stopper section in a combustion chamber hole side rather than this bead. This stopper section restricts the amplitude of expanding-and-contracting deformation of the bead by the repeated load based on the explosion gas pressure of a combustion chamber, and it is already good that it is also what achieves the function to prevent the setting of a bead, and it is known while compensating and carrying out the seal of the gap between the planes of composition produced in the circumference of a combustion chamber by the bow of the cylinder head, when a metallic gasket is fastened between the planes of composition of the cylinder head and a cylinder block and bolt conclusion is carried out.

[0003] Instead of installing the stopper section which functions as mentioned above inside a protruding line bead with a SIMM plate etc., forming the stopper section in the interior of the protruding line bead itself is indicated by JP,2-59361,U by filling up the cavity on the background of internal sky Mabe of a protruding line bead, i.e., a height, with the plastic surgery wire or thermal-spraying layer of a metal with height lower than this internal sky Mabe's height. Since the stopper section included in the interior of this protruding line bead does not need a special installation area, it has the advantage which can respond to the inclination of engine miniaturization advantageously.

[0004] Furthermore, it is the metallic gasket used for JP,62-3340,B as an inlet-manifold gasket etc. The metallic gasket with which it was filled up so

that the sealant ingredient of elastic elastomers, such as a silicone elastomer, might be selectively filled to internal sky Mabe of protruding line embossing which surrounds penetration opening is indicated. When a gasket is compressed between the opposed faces of a couple, it acts so that the O ring which the above-mentioned sealant ingredient supported embossing so that it might not become flat, it made concentrate compressive force on the embossing range, and confined in the hollow may act, and carrying out a seal effectively is indicated.

[0005]

[Problem(s) to be Solved by the Invention] A metallic gasket is fastened between the planes of composition of the cylinder head and a cylinder block, and the magnitude of the gap between the planes of composition produced in the circumference of a combustion chamber when bolt conclusion is carried out has a large gap in the part which the magnitude of a gap differs and is isolated from a bolthole by the part close to the bolthole by which it is not uniform and large clamping force joins the circumference of a combustion chamber, and the part isolated from the bolthole which comparatively small clamping force joins.

[0006] In the part which the height of the stopper section sets at least to each part of the circumference of a combustion chamber hole, and isolates from a bolthole with a large gap uniformly therefore in the above-mentioned conventional metallic gasket for the cylinder heads, it does not have only the height which the stopper section can fully compensate for the above-mentioned gap, and seal planar pressure required for the stopper section may not be obtained. Therefore, in the metallic gasket which prepared internal sky Mabe of a protruding line bead own [ above mentioned ] the stopper, the seal planar pressure by the toe of bead may be insufficient, and the seal of the gas of a combustion chamber may not be able to be carried out. Such a problem is remarkable especially when there is an irregular part, like the magnitude of the gap between planes of composition does not change smoothly by the circumference of a combustion chamber, but a gap becomes large rapidly locally according to engine structure.

[0007] This invention is what solves the above-mentioned trouble in the metallic gasket which prepared the stopper section for own internal sky Mabe of a protruding line bead which surrounds the aforementioned combustion chamber hole. The gap between the planes of composition produced in the circumference of a combustion chamber when a gasket is fastened between the planes of composition of the cylinder head and a block and bolt conclusion is carried out While enabling it to fully compensate, setting at least to all of the circumferences of a combustion chamber hole and equating seal planar pressure by the stopper section also in the part isolated from the bolthole When there is the above-mentioned irregular part, it aims at making as [ hold /

sufficient seal engine performance ].

[0008]

[Means for Solving the Problem] The metallic gasket of this invention which attains the above-mentioned object In the metallic gasket equipped with the protruding line bead which consists of a metal plate which has elasticity, has at least one combustion chamber hole and two or more boltholes, and surrounds this combustion chamber hole in the periphery section While filling up internal sky Mabe of the above-mentioned protruding line bead with a hard synthetic-resin layer and forming the stopper section Become the outside of the above-mentioned protruding line bead from a rubber-like elasticity object, and an auxiliary seal ring with height higher than this protruding line bead is prepared. The restoration height of the above-mentioned hard synthetic-resin layer does not exceed above-mentioned internal sky Mabe's height, but makes restoration height low in the part which moreover approaches a bolthole, and is characterized by making restoration height high in the part isolated from a bolthole.

[0009] The metallic gasket of this invention is constituted as above-mentioned, and although the compression set of the protruding line toe of bead is carried out to the height which added the board thickness of a metal plate to the restoration height of a hard synthetic-resin layer, i.e., a stopper's height, when a gasket is bound tight and compressed between the planes of composition of the cylinder head and a block since the stopper section which filled up with the hard synthetic-resin layer internal sky Mabe of the protruding line bead which surrounds a combustion chamber hole is formed, it is not compressed any more. Therefore, when a gasket is bound tight between planes of composition, while a protruding line toe of bead produces high seal planar pressure on a plane of composition according to the stability of a bead and the thickness effectiveness of the stopper section which deformed elastically, the amplitude of the repetition expanding-and-contracting deformation of a bead based on the explosion gas pressure of a combustion chamber is restricted.

[0010] In this case, it sets to the metallic gasket of this invention. Since it is made high in the part low [ of a hard synthetic-resin layer / restoration / in the part which approaches a bolthole to compensate for fluctuation of the magnitude of the gap between the planes of composition which can be set at least to each part of the circumference of a combustion chamber ] and isolated from a bolthole When a gasket is bound tight between planes of composition, the stopper section sets at least to each part of the circumference of a combustion chamber hole, the gap between the above-mentioned planes of composition is compensated well, and the seal planar pressure in a protruding line toe of bead is equated at the circumference of a combustion chamber hole.

[0011] When applying to the engine which has the aforementioned irregular

part even when constituted as mentioned above, or when big variation and irregularity are in restoration of a hard synthetic-resin layer Although it is easy to produce the leakage of the gas of a combustion chamber, it sets to this invention. Since it became the outside of a protruding line bead, i.e., a combustion chamber hole and an opposite hand, which build in the stopper section from the rubber-like elasticity object and has the auxiliary seal ring with height higher than a protruding line bead, when above, the seal of the gas of a combustion chamber can be carried out effectively. As for the height of an auxiliary seal ring, it is desirable to be 0.05 thru/or that it is higher than the height of a protruding line bead 0.1mm.

[0012] In addition, having formed the auxiliary seal of the outside of a protruding line bead in this invention not with a metal bead but with the seal ring which consists of a rubber-like elasticity object is based on the following reason.

\*\* Since elasticity and the amount of restoration are large, the gap between planes of composition of the circumference of a combustion chamber hole can respond, also when unusually large.

\*\* It is soft, and since the load rate is small, it is rare to consume bolt clamping force.

\*\* There is little occupancy area compared with the case where a metal bead is used as an auxiliary seal, end, and processing is also easy.

[0013] The packed bed which forms the stopper section in the gasket of this invention consists of hard synthetic resin, such as an epoxy resin. The elastomer filled up with elastomers, such as a silicone elastomer, when a protruding line bead was compressed in having been selectively filled up so that it might leave internal sky Mabe the non-filled up section deforms like a metallic gasket given [ above mentioned ] in JP,62-3340,B, irregular stress is given to a protruding line bead, this is repeated by the alternation-expanding-and-contracting deformation of a bead based on the gas pressure of a combustion chamber, and there is risk of producing a crack and breakage in a protruding line bead. It is filled up with the hard synthetic-resin layer which does not deform substantially in compression of a protruding line bead, and restoration in this invention, and the stopper section is formed.

[0014]

[Embodiment of the Invention] The detail of the metallic gasket of this invention is explained below based on the drawing of an example. The same sign in a drawing shows the same part.

[0015] The metallic gasket of the first example of this invention is shown in drawing 1 - drawing 3 . Drawing 1 is a top view and drawing 2 and drawing 3 are the expanded sectional views by the A-A line and B-B line of drawing 1 , respectively. Metallic-gasket G consisted of a metal plate 1 which has the

elasticity of a stainless steel plate etc., had two or more combustion chamber holes 2 of the configuration adjusted in an engine combustion chamber, and is equipped with two or more boltholes 3 which insert in the bolt which concludes the cylinder head to a cylinder block. Gasket G was equipped with the protruding line bead 4 which surrounds the above-mentioned combustion chamber hole 2 in the periphery section, approached the protruding line bead 4 on the outside of the protruding line bead 4, i.e., the combustion chamber hole 2 and an opposite hand, and is equipped with the annular auxiliary seal ring 8 which consists of a rubber-like elasticity object and projects in the same direction as the protruding line bead 4. In addition, in drawing 1, in order to simplify drawing, by liquid path holes, such as a water channel and an oil hole, and drawing 2, and drawing 3, the graphic display of the sealant layer 7 currently illustrated is omitted, and the protruding line bead 4 is represented with the alternate long and short dash line which shows the top-most vertices, and is illustrated. Also in after-mentioned drawing 5, it is the same.

[0016] The height and width of face of the above-mentioned protruding line bead 4 are set at least to each part of the circumference of the combustion chamber hole, are fixed and have fixed height h and width of face W. Internal sky Mabe 5 on the background of the height of a protruding line bead is filled up with the hard synthetic-resin layer 6, and the stopper section is formed. restoration height d1 in the part which sets at least to each part of the circumference of a combustion chamber hole of a protruding line bead and is not fixed as for the restoration height of the hard synthetic-resin layer 6, and is isolated from a bolthole 3 Restoration height d2 in the part which is high and approaches a bolthole 3 low -- carrying out --  $d1 > d2$  \*\* -- it is carrying out.

[0017] If examples, such as restoration height, are shown, the board thickness of a metal plate will usually be 0.1 thru/or 0.3mm, and height h of a protruding line bead will usually be 0.1 thru/or about 0.2mm. Although there is no inconvenience even if it is the height filled up with internal sky Mabe 5 100%, unless the height of a hard synthetic-resin packed bed exceeds internal sky Mabe's 5 height, in order to set at least to all the circumference of the combustion chamber hole of a protruding line bead and to secure elastic deformation of a bead It is desirable to make the non-filled up section with a height of at least 0.1mm remain also in the part where restoration height is the highest, and it is d1. It is more desirable than internal sky Mabe's 5 height (equal to height h of a protruding line bead) to choose it as 0.1 thru/or the range of 0.2mm low so that it may leave the non-filled up section. d2 It is desirable to choose it as 0.03 thru/or the range of 0.06mm.

[0018] Even if the hard synthetic-resin layer 6 receives compressive stress, it is not compressed substantially, but it is the incompressibility and the non-deformans which do not deform substantially, and an epoxy resin is used

preferably. Moreover, minerals fillers, such as talc, clay, glass, a silica, and an alumina, are preferably blended with an epoxy resin.

[0019] The auxiliary seal ring 8 is an annular ring of the cross-section semicircle which consists of heat-resistant rubber-like elasticity objects, such as fluorine rubber, silicone rubber, nitrile rubber, and acrylic rubber, makes the protruding line bead 4 approach on Men of the side from which the protruding line bead 4 of a metal plate 1 projects, and fixes with a binder etc. As for height L of this auxiliary seal ring 4, it is more desirable than the height which added the thickness of the after-mentioned sealant layer 7 to height h of a protruding line bead to have 0.05 thru/or height high 0.01mm. In addition, the cross-section configuration of the auxiliary seal ring 8 is not restricted to a semicircle, but can adopt various cross-section configurations.

[0020] In both sides of a metal plate 1, the sealant layer 7 which makes a subject the rubber-like elasticity object which has thermal resistance and flexibility in rear-spring-supporter annular on the outside of the protruding line bead 4 from the periphery of the combustion chamber hole 2 is covered. Although this sealant layer 7 may compensate the contacting cylinder head and the surface roughness in the plane of composition of a cylinder block, distortion, a minute blemish, etc. and a rear-spring-supporter coat may be carried out to whole both sides of a metal plate 1, that function can be achieved also by covering annularly around the liquid path hole which is omitting the graphic display annularly around a combustion chamber hole like a graphic display. However, since a function with the same auxiliary seal ring which consists of the above-mentioned rubber-like elasticity object in this invention is also achieved, the sealant layer 7 of the circumference of a combustion chamber hole is also omissible.

[0021] Metallic-gasket G which gave [ above-mentioned ] explanation is fastened between the planes of composition of the cylinder head H and a cylinder block D, bolt conclusion is carried out, and the same sectional view as drawing 2 about the condition which compressed the gasket is shown in drawing 4 . In drawing 4 , in order to simplify a drawing, the graphic display of the sealant layer 7 is omitted. For the protruding line bead 4, the height is the height d1 of the stopper section, i.e., the restoration height of the hard synthetic-resin layer 6, by compression of Gasket G. It is compressed until it becomes equal, and a hard synthetic-resin layer serves as a stopper, and it is not compressed any more. Thus, gap S1 between the planes of composition of the cylinder head H and a cylinder block D While compensating, high seal planar pressure is given on a plane of composition, and the good seal engine performance is conjointly secured with the auxiliary seal ring 8 of the outside. [ in / in the compressed protruding line bead 4 / a combustion chamber periphery ]

[0022] The metallic gasket of the 2nd example of this invention is shown in drawing 5 thru/or drawing 7. Drawing 5 is a top view, drawing 6 is an expanded sectional view by the A'-A' line of drawing 5, and drawing 7 is an expanded sectional view by the B'-B' line of drawing 5. In the 2nd example, spacing between a combustion chamber and a hole 2 is small, therefore the protruding line beads 4 and 4 which surround the adjoining combustion chamber holes 2 and 2 coalesce between combustion chamber holes, and form the protruding line bead of one articles. Moreover, the auxiliary seal ring 8 of the outside of the protruding line bead 4 is not extended between combustion chamber holes, but the auxiliary seal ring of an adjoining combustion chamber hole is formed in a series of auxiliary seal rings which each other were connected and continued in the both-sides section a between holes. In this case, since it does not extend between the combustion chamber holes where thermal conditions are severe, the demand to the thermal resistance of a seal ring is eased.

[0023] The height of the protruding line bead 4 is the width of face W1 in the part which it is fixed, sets at least to each part of the circumference of a combustion chamber hole of a bead, sets at least to each part of the circumference of a combustion chamber hole and is not fixed as for the width of face of a protruding line bead although it has fixed height h, and is isolated from a bolthole 3. Width of face W2 in the part to which width of face is narrow and approaches a bolthole 3. Width of face is wide and it is  $W2 > W1$ . It is formed. Therefore, the load rate of the protruding line bead 4 is size from the part where the part isolated from a bolthole 3 approaches a bolthole 3.

[0024] The height of the stopper section in internal sky Mabe 5 of the protruding line bead 4, i.e., the restoration height of the hard synthetic-resin layer 6, is high like the 1st example in the part isolated from a bolthole 3, and it is made low in the part close to a bolthole 3. Therefore, a fill can become fixed, if it puts in another way so that the cross section of the hard synthetic-resin layer 6 which fills up internal sky Mabe 5 of the protruding line bead 4 with the width of face of a protruding line bead in the gasket of the 2nd example conjointly with making it change as mentioned above may set at least to each part of the circumference of a combustion chamber hole and may become fixed. Thus, it is very advantageous that a fill is made to regularity at the point which makes restoration of a hard synthetic-resin layer a precision, and is made easy. Moreover, in this example, from the part where the part which the load rate of a bead isolates from a bolthole 3 as aforementioned approaches a bolthole 3, since it is size, the seal planar pressure by the protruding line bead is equated further at the circumference of a combustion chamber hole.

[0025] Although all the examples explained above are veneer metallic gaskets,

it is not restricted to this, and the metallic gasket by this invention carries out [ for example, ] the laminating of a back plate or the faceplate to one side or both sides of a gasket of the 1st example, or it can make two gaskets of the 1st example able to counter so that the top-most vertices of a protruding line bead may contact, and can also constitute it as a laminated metal gasket by carrying out a laminating etc. Moreover, in the above-mentioned example, although the cross-section configuration of a protruding line bead was made into Yamagata and a semicircle, it can also make not only this but a trapezoid etc. a proper configuration.

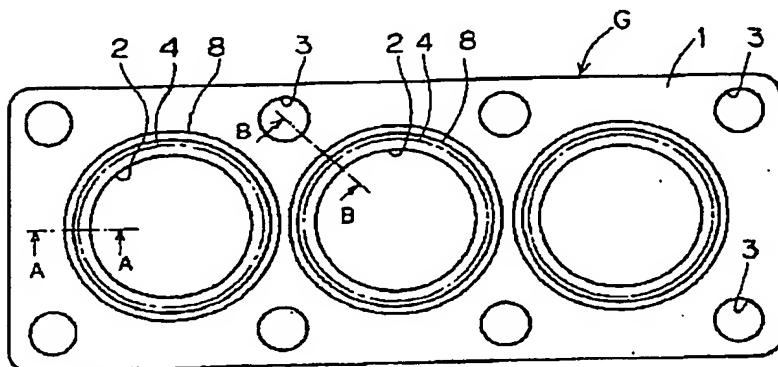
[0026]

[Effect of the Invention] In the metallic gasket of this invention which has a configuration and an operation as explanation was given [ above-mentioned ] When a gasket is fastened between the planes of composition of the cylinder head and a cylinder block and bolt conclusion is carried out, To the size of the gap between the planes of composition in the part close to a bolt, and the part isolated from a bolt, \*\*\*\*\*\*, It sets at least to each part and the stopper section fully compensates the gap between planes of composition, and the seal planar pressure by the protruding line bead can be set and equated by at least each part of the circumference of a combustion chamber hole, can be set at least to each part, and can obtain high seal planar pressure. Moreover, in the gasket of this invention, when variation and irregularity are in the fill of a case as there is an irregular part where the magnitude of the gap between the above-mentioned planes of composition does not change smoothly by the circumference of a combustion chamber, but a gap becomes large rapidly locally, or a hard synthetic-resin layer, the auxiliary seal ring which consists of a rubber-like elasticity object of the outside of a protruding line bead prevents leakage of the gas of a combustion chamber, and the seal engine performance improves. Furthermore, according to this invention, there is an advantage which can form easily and cheaply the stopper section from which it sets at least to each part and height differs.

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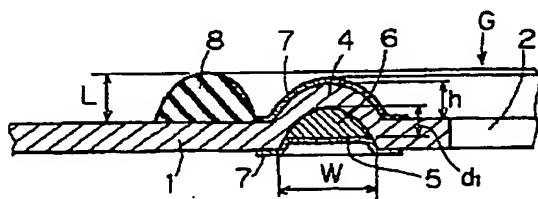
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Drawing selection drawing 1



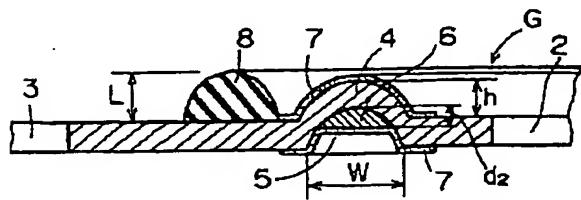
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Drawing selection drawing 2



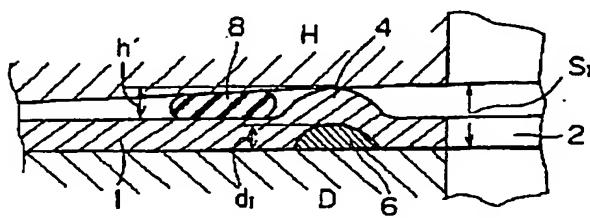
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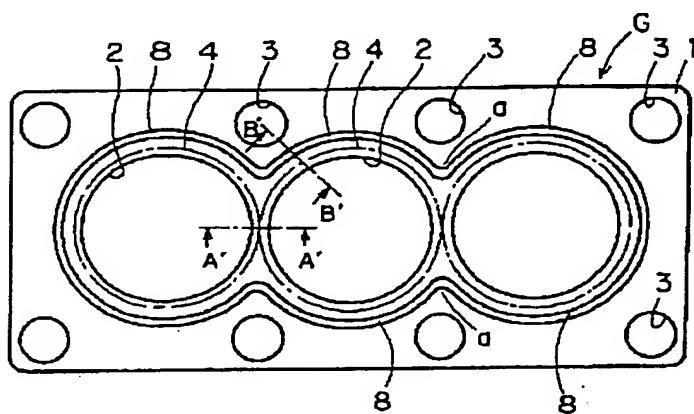
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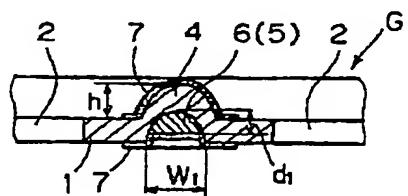
Drawing selection drawing 5



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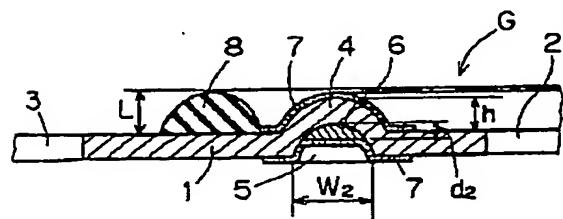
Drawing selection drawing 6



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Drawing selection drawing 7



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